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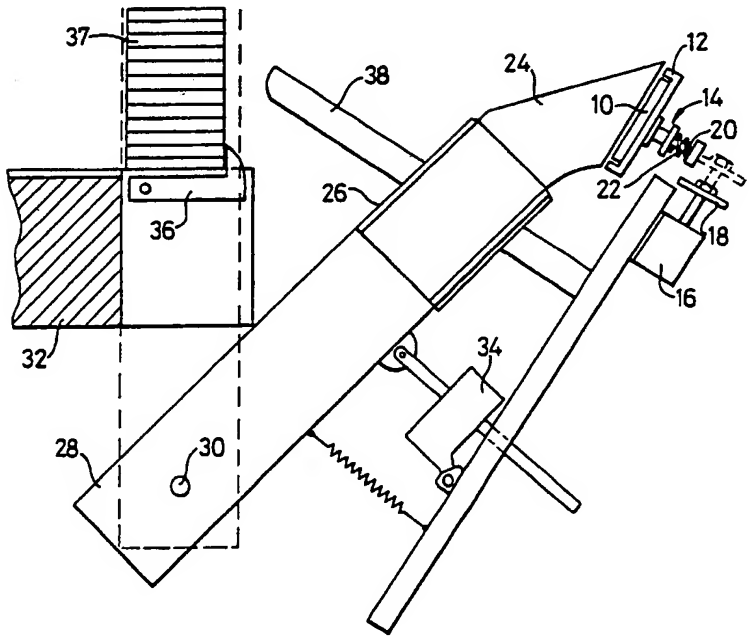

(57) Abstract

Tokens (10) passing along a track (12) are distinguished by means known *per se* for ejection from the track (12) at appropriate locations. At each location is provided a mechanism for forming a stack (37) of tokens and depositing the stack (37) on the surface of a table (32). Said mechanism includes a stack holder (26) which receives tokens from above, and means (34) for moving the stack holder (26) into a predetermined relationship with the table (32).

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Sorting Coins, Tokens and the like

This invention related to the sorting of coins, tokens gaming chips and similar planar articles which are distinguished by size and/or shape and/or colour. The invention will be described hereinafter with particular reference to roulette, but it will be appreciated that other applications are equally possible.

In playing roulette it is conventional to use disc-shaped chips of equal size but of differing colours denoting different players. It is necessary for the chips to be sorted by colour after use and the sorted chips are conventionally stacked in stacks of 20 on the table. There is known (see British Patent Number 1 571 219) an apparatus for sorting chips automatically by colour. This known apparatus is positioned substantially under the gaming table and the sorted chips are presented in stacks which are fed upwardly in guides which project above the surface of the table and from which the croupier must remove groups of twenty chips and place them on the table.

One object of the present invention is to provide an improved sorting apparatus in which stacks of chips or the like are automatically fed onto the surface of a table or the like.

In known forms of roulette table it is necessary for the croupier to remove chips from the "layout" on which bets are placed by means of a rake. In the case of the prior art apparatus referred to above the non-winning chips can be raked into a chute for automatic sorting. A further object of the present invention is to enable the clearing of the chips to be performed more quickly.

Accordingly the present invention in one aspect provides an apparatus for sorting coins, tokens, chips or the like (hereinafter for convenience referred to as "chips"), comprising a hopper for receiving mixed chips, endless conveyor means arranged to receive chips one-by-one from hopper, discrimination means adapted to produce a signal identifying the value of each chip passing along the conveyor, and a plurality of means for forming chips into stacks, each such means comprising an ejector mechanism responsive to a signal from the discrimination means for ejecting a chip from the conveyor as the chip passes the ejector mechanism to fall into a stack holder arranged to receive ejected chips and form then into a stack, means for determining when the stack reaches a predetermined level, and a displacement device responsive to the determining means to cooperate with the stack holder to position the latter on a table top or similar planar surface and then withdraw the stack holder from the stack of chips.

In one form the stack holders are mounted on respective arms positioned under the table surface and the displacement device is operable to pivot the respective arm through a slot in the table to position the stack level with the table surface, a detent being provided to retain the stack on the table surface. In another form each stack holder is vertical having its bottom aligned with the table surface, and the displacement device is operable to push the stack holder forward onto the table surface.

The discrimination means may comprise an optical/electronic arrangement for discriminating chips by colour, or an electronic or mechanical arrangement for discriminating by size or weight. Such means are well known in principle to those skilled in the art.

From another aspect the present invention provides a gaming table having a playing surface bearing a layout on which chips are placed to indicate bets at predetermined odds, the playing surface in the area of the layout comprising at least one movable surface portion operable to deposit chips thereon into a hopper below the table.

In one form, a respective movable surface portion is provided for each bet possible on the layout, and means are provided for selective operation of the movable surface portions to remove the chips corresponding to losing bets at the end of a game.

Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig 1 is a diagrammatic side view of part of one apparatus embodying the invention,

Fig 2 is a similar view of an alternative embodiment,

Fig 3 is a plan view of part of Fig 2,

Fig 4 is a diagrammatic cross-section of a grooved guide which may be used when the mechanisms of Figures 1 to 3,

Fig 5 is a diagrammatic isometric view of an apparatus incorporating the mechanism of Fig 1,

Fig 6 is a side view, partly in section, of another alternative stacking arrangement,

Fig 7 is a plan view, to an enlarged scale, of part of Fig 6 and,

Fig 8 is a plan view of part of a roulette table incorporating the invention.

Referring to Fig 1, a chip 10 is shown in a chip carrier 12 mounted on a chain 14 which forms part of an endless conveyor known per se. The apparatus includes a plurality of stack-forming stations, one of which is seen in Fig 1, one for each colour of chip. In the following description of Fig 1, it will be understood that the other stack-forming stations are identical.

An ejector mechanism comprises a solenoid 16 whose armature carries a washer 18. On actuation of the solenoid 16, the washer 18 is moved to the position shown in broken lines, causing a pin 20 to slide in the chain 14 against the bias of spring 22. This movement of the pin 20 throws the chip 10 clear of the chip carrier 12 to fall through a guide 24 into a stack holder 26. The stack holder 26, which will be described in greater detail below, is mounted on the end of an arm 28 which is pivotally mounted at 30 below the edge of a table 32. When the stack holder is full with a predetermined number of chips eg. twenty, the arm 28 is pivoted upwardly by means such as a pivoted solenoid 34 or an electric motor or cam to align the stack holder 26 with the surface of the table 32. A sprung detent 36 retains the chips in a stack 37 on the table while the solenoid 34 returns the arm 28 and stack holder 26 to the position shown.

Figs 2 and 3 show an alternative mechanism in which the parts 10, 12, 14, 16, 18, 20 and 22 are the same. A Stack holder 26'is sliding reciprocable on the table 32' by means of solenoid 34', or equivalent means such as a motor or cam. When the stack has been formed in the holder 26', it is moved forward by the solenoid 34' and the holder 25' withdrawn.

As seen in Fig 3, the stack holder 26' may suitably be formed by half-cylindrical member 26a, 26b hinged together at 26c. The members 26a, 26b are biased towards an open position by spring 26d, but in the chip-catching condition shown are held shut by rails 38. A similar arrangement may be used for the stack holder 26 of Fig 1. Alternatively, the member 26a, 26b could be biased shut and opened by a cam.

The table surface is suitably provided with grooves indicated in Fig 3 and shown in cross-section in Fig 4. The bottom chip rests on a surface 40 and is guided by shoulder 42, thus allowing a row of stacks to be built up and pushed forward. A central slot 44 enables a user's finger to be inserted beneath a stack to assist in lifting it.

It will be understood that chips are picked up one-by-one in the carriers 12 from a hopper or the like, and pass through a discrimination means known per se. For example, for roulette chips the discrimination means will typically operate by illuminating the chips with white light and passing them under a series of photodetectors each provided with a colour filter to produce a signal identifying the colour of each chip in the sequence. These signals are then used to actuate the appropriate solenoid as a give chip passes it. In the present embodiments, the stack holder is not available to receive chips while it is engaged in placing a completed stack on the table surface; the related ejection solenoid is disabled during this operation, and any chip of that colour arriving is simply recycled.

Fig 5 illustrates a typical shape and size for a sorter embodying the Fig 1 mechanism and its relationship to table height. This could be made as a freestanding unit which could be wheeled up to an existing table so that the flat surface 46 forms an extension of the table top. A hopper opening 48 may be provided into which chips can be raked.

Figs 6 and 7 illustrate another modified form of stacking mechanism. Chips are sorted as before by the elements 10-18. A chip when ejected falls into a stack holder 26' which is one of three such pivotally mounted on arms 60 equispaced about a shaft 62. Each stack holder 26' has a weight 64 to maintain it vertical an aperture 66 in its bottom, and a slot 68 extending along one side (see Fig 7b).

When a predetermined number (eg 20) of chips has been stacked in a stack holder 26', the shaft 62 is rotated to swing the stack holder 26' in an arc past an edge of the table surface 40, which is provided with ribs 42 and groove 44 as before. A finger assembly 70 is biased outwardly from the table edge by spring 72. The arrangement is such that the finger assembly passes through the aperture 66 as the holder 26' reaches it to engage the bottom of the stack. Further arcuate movement of the arm 60 causes the stack to be pushed out of the holder 26' onto the surface 40 by the rear face of the holder 26'.

Thus, the mechanism of Figs 6 and 7 again provides a means of forming stacks of chips and placing these on the surface of a gaming table (or a surface contiguous therewith).

A further aspect of the invention will now be described. In roulette, for example, a "layout" of standard format is provided for placing bets. This conventionally consists of a grid-like pattern defining square and rectangular boxes. Bets may be placed by positioning chips within a box (gambling on the result defined by that box occuring), on a line (gambling on the result defined by the two adjacent boxes), or on an intersection of lines (gambling on the result defined by the four adjacent boxes). Clearing the table of winning and losing bets at the end of a game is a time-consuming operation.

Referring to Fig 8, part of a roulette layout is shown. Instead of simple lines, the boxes 50 are divided by areas 52 whose width is approximately that of a chip 10, and thus intersections 54 capable of accommodating a chip (or stack of chips) are formed. Each part 50, 52, 54 of the table surface is formed by a hinged element which can be pivoted down, trapdoor style, to deposit the chips thereon into a hopper or conveyor for sorting as described above. The sections 50-54 can suitably be actuated by solenoids or pneumatic actuators controlled by a central computer or

other means. Thus, it would be possible to enter a winning number by keyboard and automatically remove all losing bets simultaneously, since the possible winning positions for any given number could readily be stored in memory.

This aspect of the invention also contemplates less comprehensive but still useful chip-removing arrangements. For example, the whole layout could be arranged on a single pivoted element whereby winning bets could be settled and then all remaining chips dumped.

Although the invention has been described with particular reference to roulette, it may also be applied to other subjects, eg sorting coins and placing them in stacks of predetermined quantity on a bank counter or the like.

CLAIMS

1. Apparatus for sorting chips (as hereinbefore defined), comprising a hopper for receiving mixed chips, endless conveyor means arranged to receive chips one-by-one from hopper, discrimination means adapated to produce a signal identifying the value of each chip passing along the conveyor, and a plurality of means for forming chips into stacks, each such means comprising an ejector mechanism responsive to a signal from the discrimination means for ejecting a chip from the conveyor as the chip passes the ejector mechanism to fall into a stack holder arranged to receive ejected chips and form them into a stack, means for determining when the stack reaches a predetermined level, and a displacement device responsive to the determining means to cooperate with the stack holder to position the latter on a table top or similar planar surface and then withdraw the stack holder from the stack of chips.

2. The apparatus of claim 1, in which the stack holders are mounted on respective arms positioned under the table surface and the displacement device is operable to pivot the respective arm through a slot in the table to position the stack level with the table surface, a detent being provided to retain the stack on the table surface.

3. The apparatus of claim 1, in which each stack holder is vertical having its bottom aligned with the table surface, and the displacement device is operable to push the stack holder forward onto the table surface.

4. The apparatus of any preceding claim, in which the discrimination means comprises an optical/electronic arrangement for discriminating chips by colour, or an electronic or mechanical arrangement for discriminating by size or weight.

5. A gaming table having a playing surface bearing a layout on which chips are placed to indicate bets at predetermined odds, the playing surface in the area of the layout comprising at least one movable surface portion operable to deposit chips thereon into a hopper below the table.

6. The table of claim 5, in which a respective movable surface

portion is provided for each bet possible on the layout, and means are provided for selective operation of the movable surface portions to remove the chips corresponding to losing bets at the end of a game.

7. A gaming table according to claim 5 or claim 6, in combination with sorting apparatus according to any of claims 1 to 4.

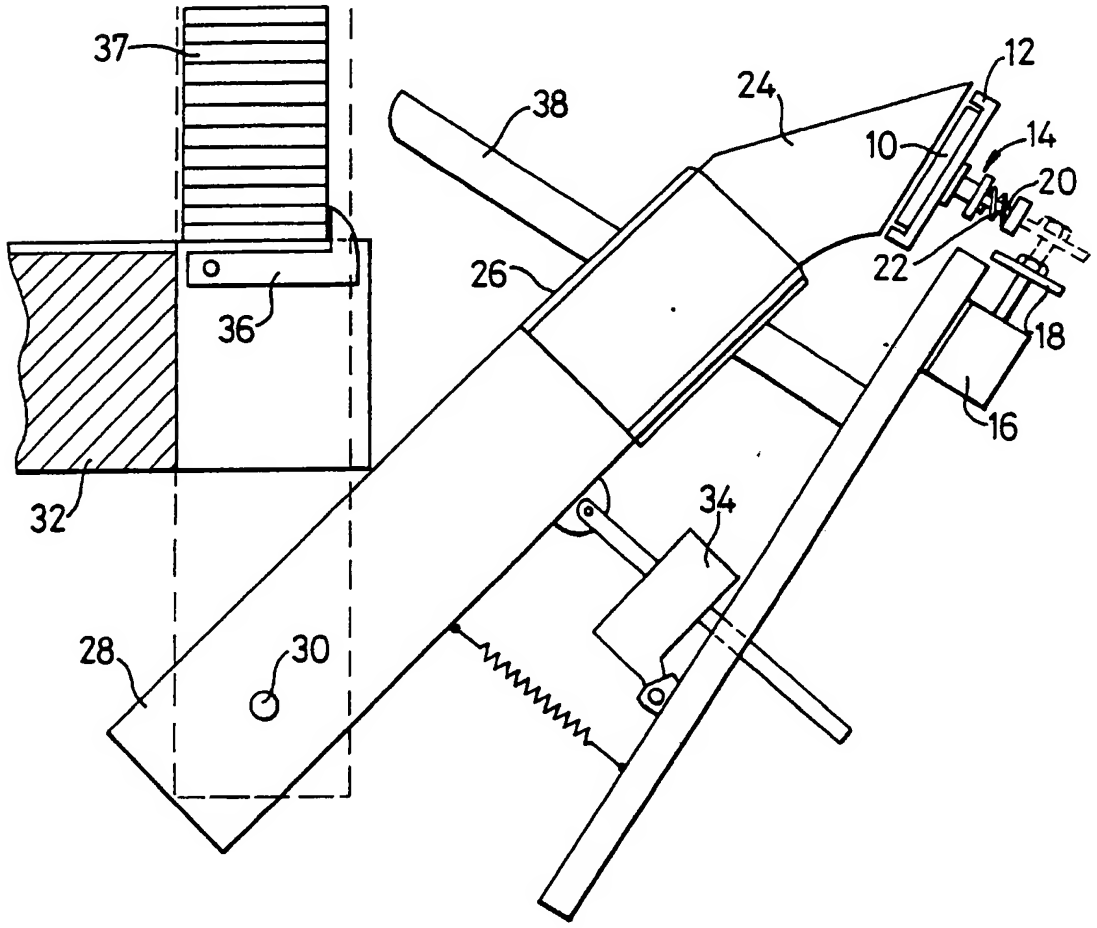

Fig. 1

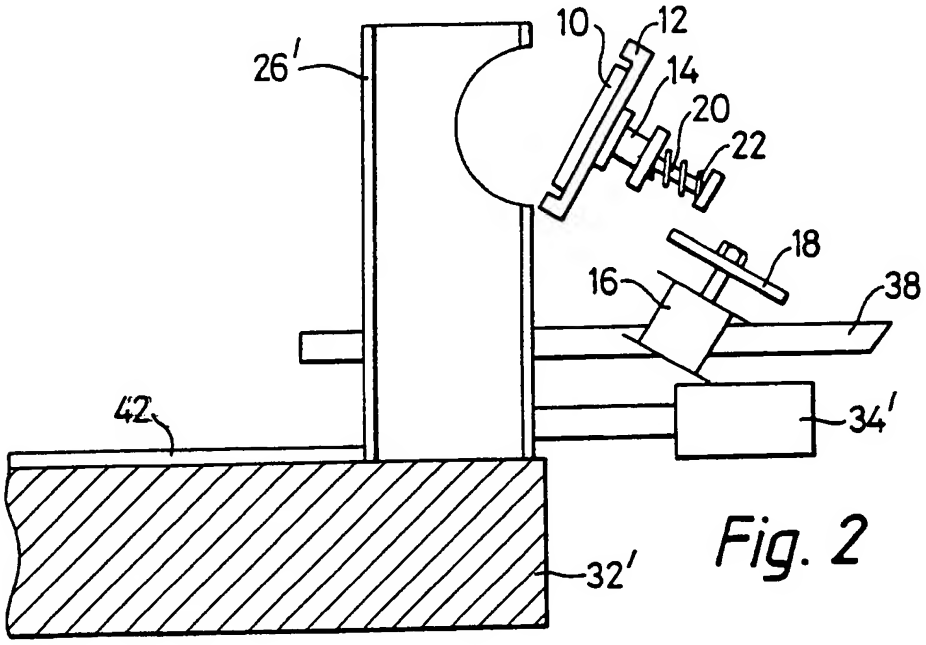

Fig. 2

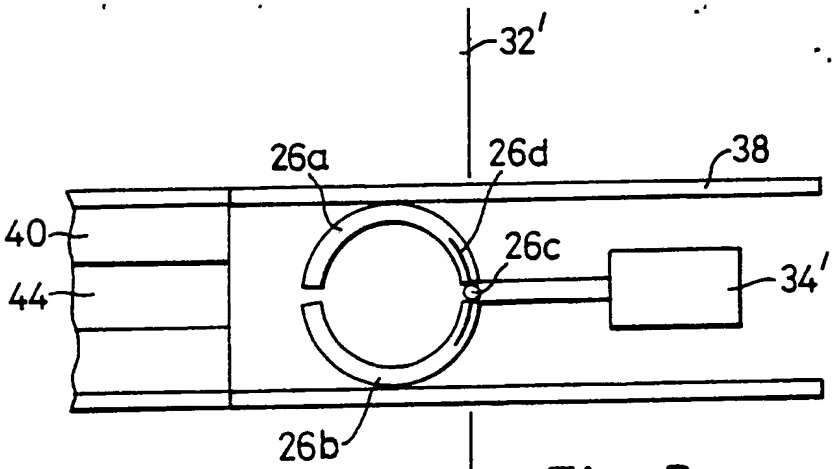

Fig. 3

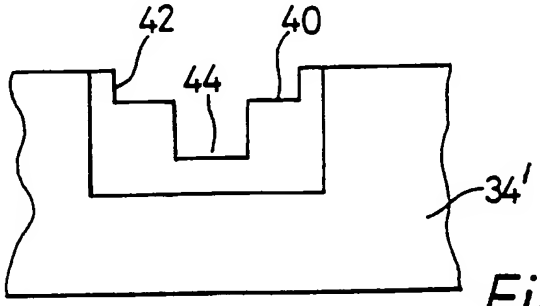

Fig. 4

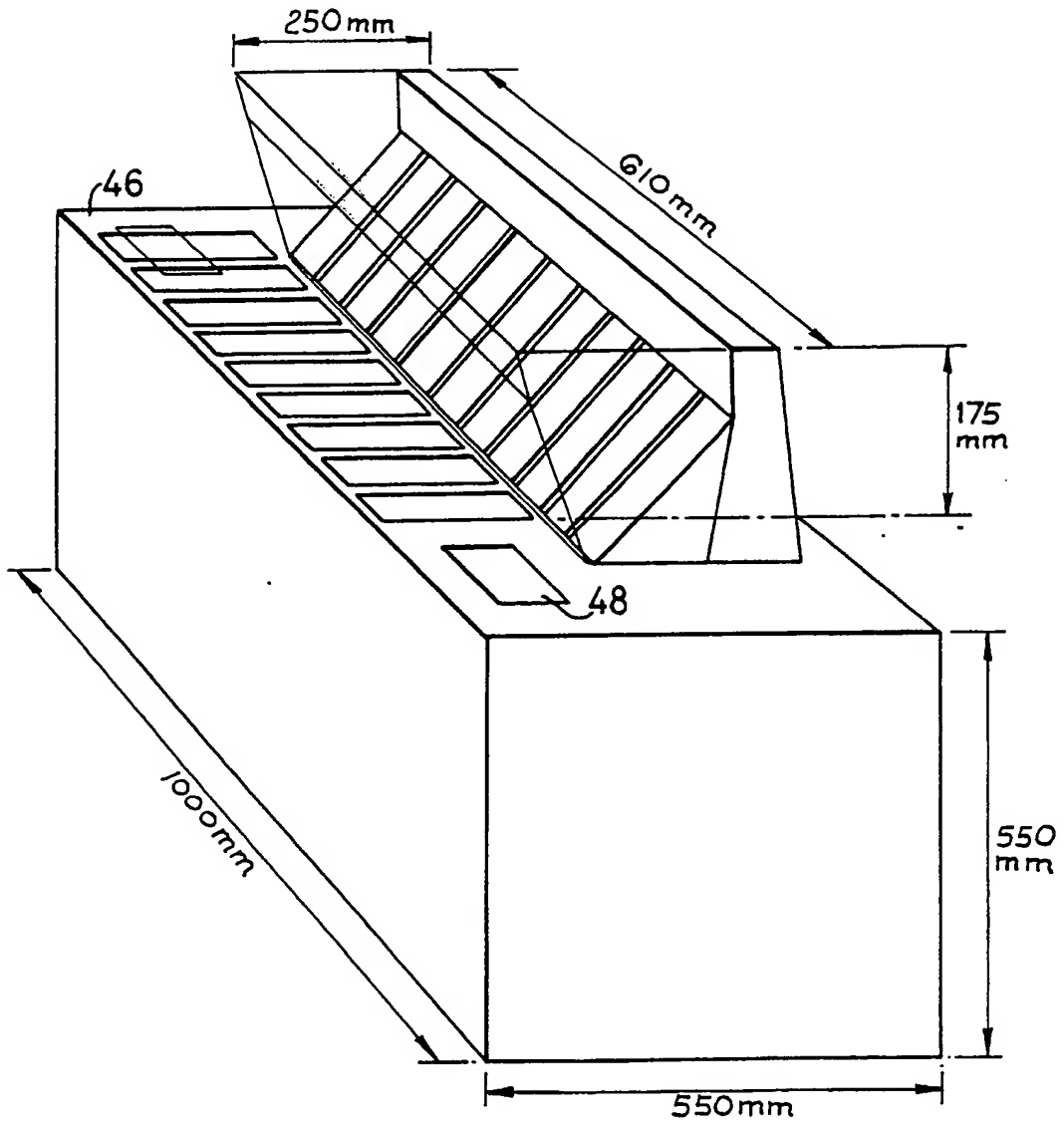

Fig. 5

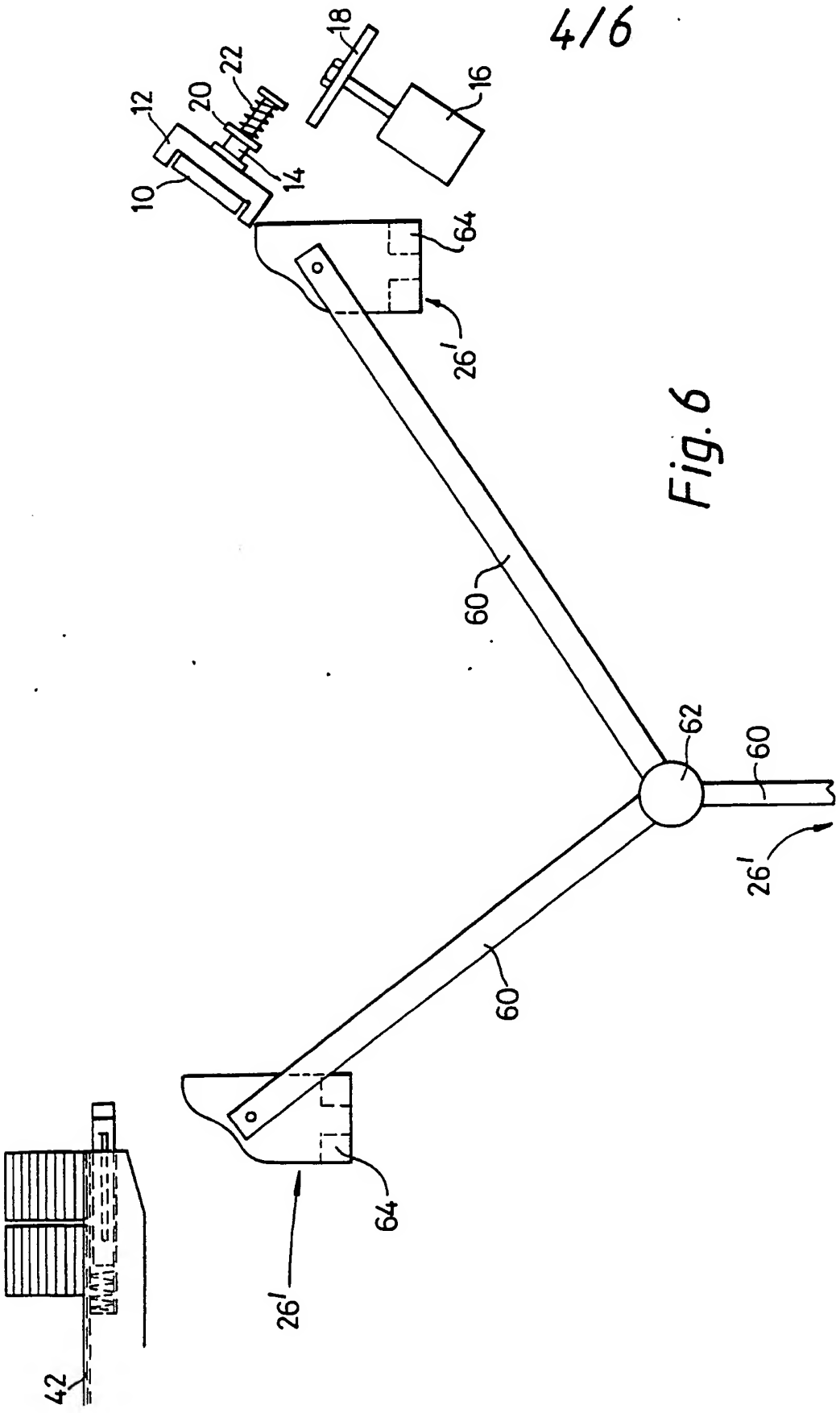

Fig. 6

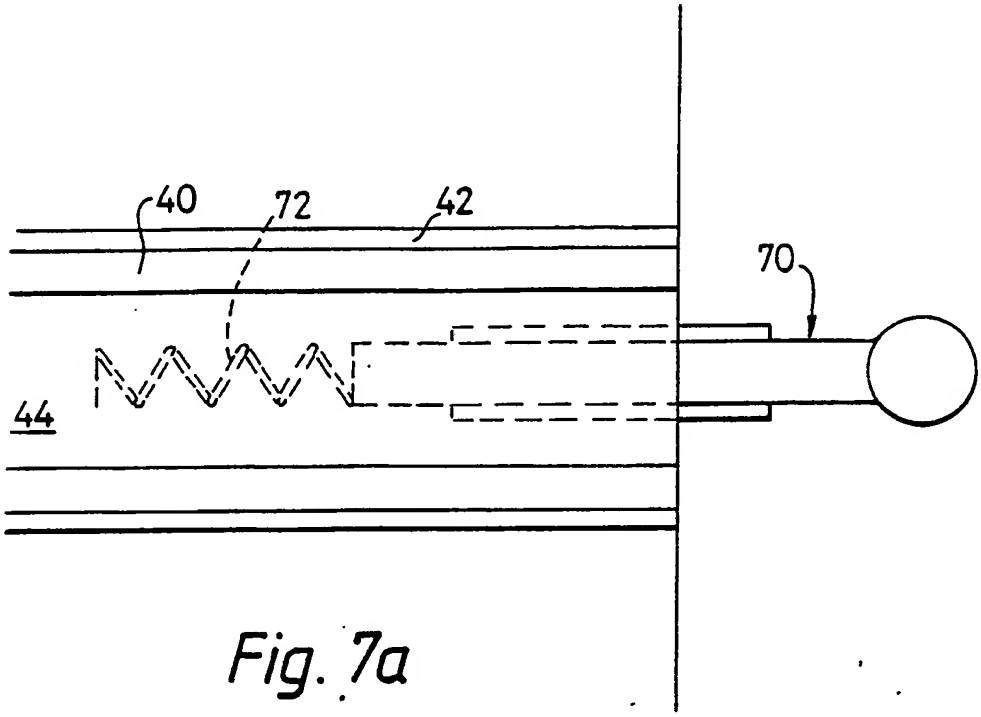

Fig. 7a

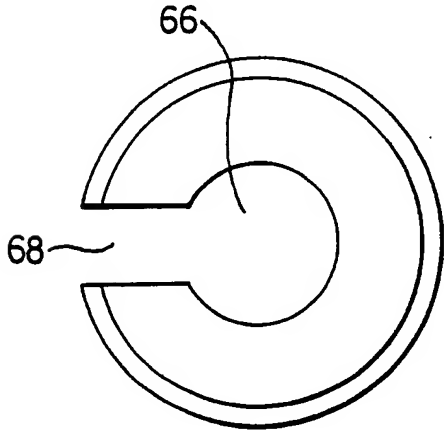

Fig. 7b

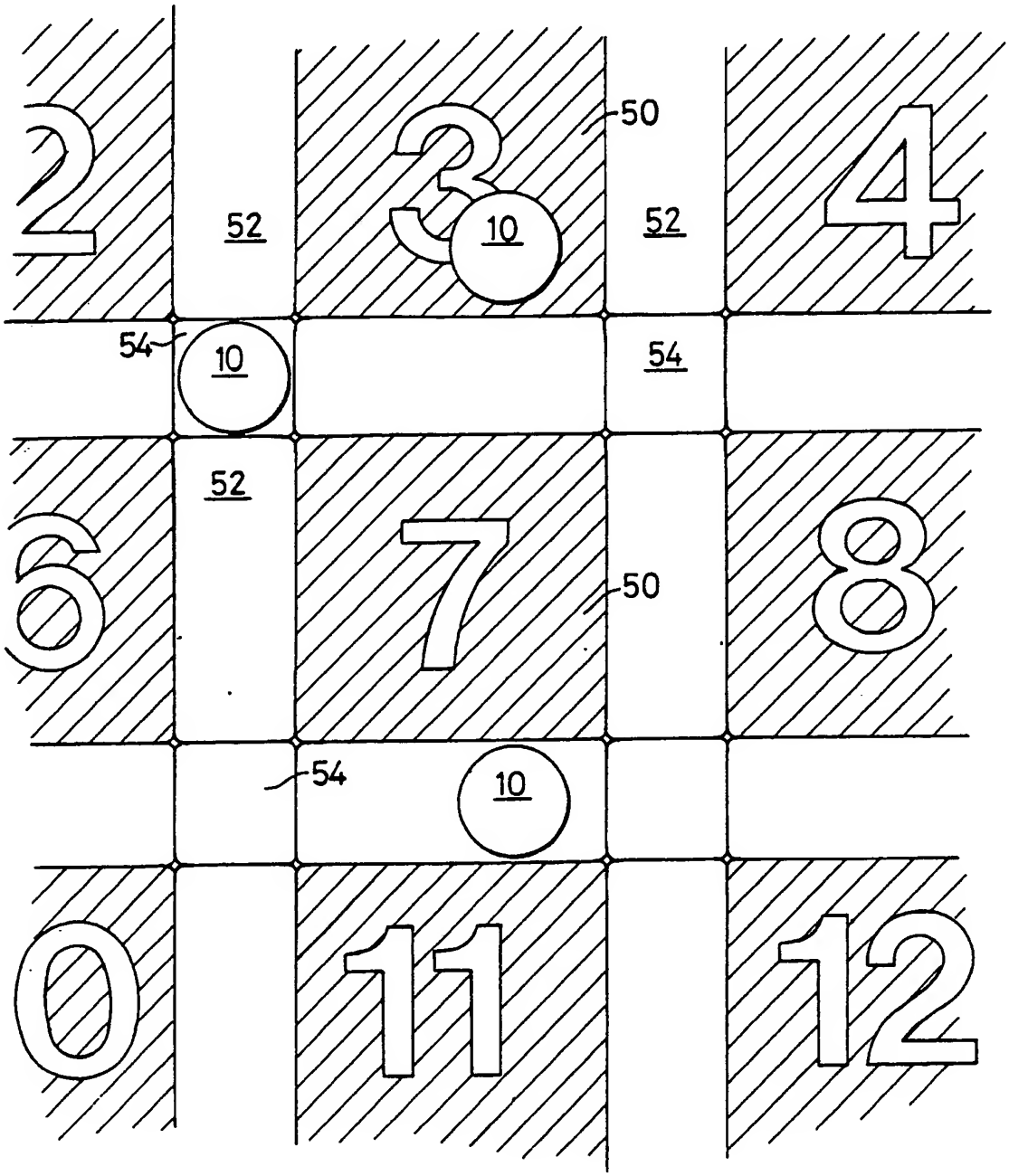

Fig. 8

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 87/00553

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [8]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: G 07 D 3/14; G 07 D 9/06; A 63 F 5/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	G 07 D G 07 F A 63 F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y	GB, A, 1571219 (B. KNUTSSON) 9 July 1980 see claims; figures	1
A	cited in the application	4
	--	
Y	US, A, 3152597 (R.C. RAU) 13 October 1964 see figures; column 1, lines 44-66; column 4, line 65 - column 5, line 27	1
	--	
X	FR, A, 1003486 (J. VILLARD) 18 March 1952 see abstract; figures	5-7
A		1,4
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P,A	GB, A, 2174228 (D.L. MORLEY) 29 October 1986 see abstract; figure 1; page 1, lines 5-24, 93-126	1,4
	--	
A	DE, C, 801257 (G. CHLESTIL) 6 October 1952	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
19th November 1987	11 DEC 1987
International Searching Authority	**Signature of Authorized Officer**
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GB-A- 1571219	09-07-80	FR-A,B 2392732	29-12-78
		US-A- 4157139	05-06-79
		GB-A- 1571220	09-07-80
		SE-A- 7614608	29-06-78
		SE-B- 410531	15-10-79
US-A- 3152597		None	
FR-A- 1003486		None	
GB-A- 2174228	29-10-86	None	
DE-C- 801257		None	

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